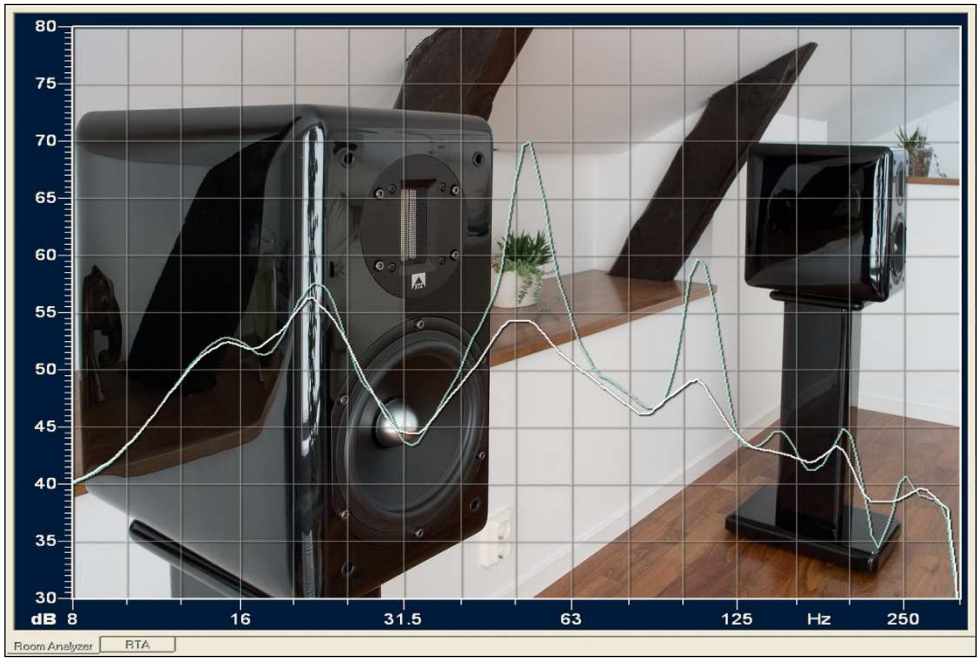
XTZ ROOM ANALYZER II / II PRO

Measurement software for room analysis and frequency response

User manual



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Introduction

Introduction

Congratulations on your purchase of the **XTZ Room Analyzer**

The XTZ Room Analyzer offers many possibilities in guiding you to calibrate and analyze your hifi or home theater system.

Please read the manual carefully before using the Room Analyzer to get the best benefits from this product.

It takes patience to get a hifi system or home theater system carefully optimized. This manual provides the basic tools to measure and analyze your systems performance.

Please feel free to contact our “free of charge” support if you lack experience of acoustical measurements or have any questions. (see **Support** info on the last page of the user manual for contact details)

WARNING!
The microphone supplied with this product is designed solely for use together with the supplied sound card (referred to as connection box in this manual. Use of the microphone along with third party equipment is not supported and may lead to malfunction or damage of your equipment.

Be careful with high sound levels. Always begin your measurements with your volume settings low and increase them as you proceed with your measurements to protect your equipment and hearing.

About XTZ

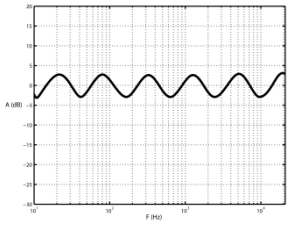
Philosophy	Our reference and starting point is to reproduce a natural sound, but we still pay attention to the fact that sound is a personal matter of taste. With the Room Analyzer we can help you reach this goal.
XTZ Goals	**To offer the best price/performance/quality ratio on the market** Our concept: - Produce the perfect compromise - Cost effective large scale manufacturing - Prioritize product quality before marketing, to achieve the best possible performance/price ratio - Reduce the number of middle men
Contact	Website: **www.xtz.se** Email: **info@xtz.se**

Technical overview

Why a complete measurement system for the end consumer?

The fact that the room adds coloration to the sound is well known, but it is not often brought to the forefront because it is hard to handle with conventional products.

Every room has unknown and unique acoustic characteristics that affect the sound quality. The biggest problems are in the low-frequency spectrum. A normal (not acoustically treated) room has several resonances and dips in that spectrum caused by standing waves or 'room modes'. Depending on the listening position these produce incorrectly balanced sound.

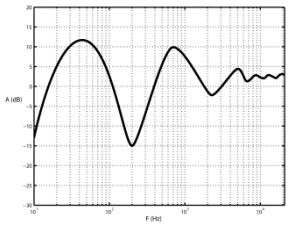


Frequency response of normal speakers

The frequency response of a good loudspeaker should be in the range of ± 3dB, but a normal room can introduce variations of ± 15dB. This leads us to the conclusion that even a very good loudspeaker can sound poor in a "bad" room. Most regular rooms suffer from severe acoustic problems.

Why room acoustic analysis software?

Room Analyzer gives an advanced analysis, as the name indicates, of the problems that exist in the room/system. Whatever your system costs you will always have a use for this instrument in optimizing your system.



Frequency response of normal room

If you spend a great deal of money on your system, it is our experience that it is a "must" to optimize the room or "remove" the problem with DSP technology . Room Analyzer is perfect for this kind of work,.

An analogy with cooking might help here…using a timer and thermometer helps you to obtain the same perfect results every time. Room Analyzer gives a picture of which frequencies in the bass region cause the problems and provides a way to correct them. Room Analyzer can measure the frequency response of any speaker.

Room Analyzer provides more analysis:

- Frequency response with RTA (Real Time Analyzer)
- Frequency response with Room Analyzer
  a. Find room modes
  b. Reverberation Time diagram (Time/Frequency/Level)
  c. Simulates the use of PEQ (Parametric Equalizer)

The analysis render following areas of use:

- Give exact values for compensation for the room modes, to a subwoofer with PEQ.
- While adjusting placements of speakers/subwoofers
- While optimizing the room with absorbents, diffusers, sound traps and more

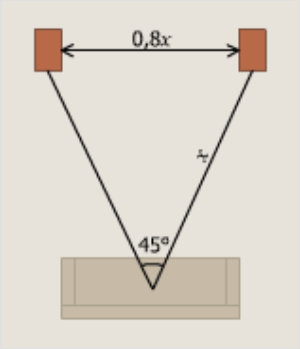
	• Measuring speakers/subwoofers	
Computer requirements	The system is based on PC technology. System demands are Win98se or later, because of the support for USB.	Minimum system: P3 - 1 GHz. 1024x768 resolution, 256 colours. Windows XP (512MB ram) Windows 98/Me/2K (256MB ram)
Microphone	The microphone is manufactured to match our requirements and the software has built in corrections for the deviations in frequency response.	
Software	The software is specially designed for XTZ by a well established audio software company. The software can be downloaded from our website. Size ~ 1 Mb	http://www.xtz.se

Unpacking

Unpacking	Check that the items below are included in the package:
Included items	**Room Analyzer II** 1 Goose neck microphone 1 Connection base 1 XLR to RCA audio cable 1 Y-split cable **Room Analyzer II PRO** 1 Microphone 1 Microphone stand 1 Connection aluminium box 1 XLR to XLR audio cable 1 XLR to RCA audio cable 1 Y-split cable

Basics of sound - installation and placement tips

	This chapter contains general information about loudspeaker placement and installation. These are general rules, so there may be exceptions.
In which room do you achieve the best sound?	Regardless how good the equipment is, in the wrong listening environment it will inevitably sound poor. There are some basic rules concerning proper loudspeaker installation:
Reflection/ absorbtion	Carpets, curtains and soft furniture absorb midrange and high frequency sounds, and this is preferable. Big empty areas, on the contrary, produce hard reflections that may lead to a blurry dialogue. Apart from coloring the sound, the perspective of the sound will also deteriorate. Reflections from the room can roughly be compared to the reflections that cause ghost pictures on a TV screen.
Amplification of bass frequencies	When a loudspeaker is placed near a wall, ceiling or floor lower frequencies will be amplified in a sometimes not desirable way (since it may lead to indistinct sound reproduction). This amplification becomes even more obvious if the loudspeaker is placed near a corner. Thus, for a sound as clear as possible, the loudspeaker should be placed at least 30 cm (about 12 inch) away from the wall.
Furniture	Be aware that furniture may vibrate, creating disturbing sounds and rattles at loud levels.
Room dimensions	Quadratic rooms or rooms where the length is exactly twice as long as the width should be avoided, since they may create unwanted resonances.
Speaker placement	The way the loudspeakers are placed towards the listener is of great importance.
Front speakers	In order to get the best results the front speakers should be placed symmetrically in front of the listener. The distance between the front speakers should be about 80% of the distance to the listener. In other words, the recommended angle between the front speakers should be 45 degrees.
Angling?	You can place the loudspeakers angled in towards the listener or straight ahead. By angling the loudspeakers inwards, you decrease unwanted reflections, enhancing the stereo perspective.



Correct height	If the loudspeakers are small, they should be placed on stands or tilted so that they are on the same level as the ears. Some speakers have other recommendations from the manufacturer – in that case follow those.
Cables	Try to keep cables as short as possible. By its electrical properties, a long conductor will have more influence on the sound than a short one. It may also work as an antenna, receiving various signals that may become a constant noise in an active subwoofer. Make sure that all connections are clean and not oxidized. All connections should be mechanically stable, both power, signal and loudspeaker cables. Signal cables should be separated from other cables.
Background noise	**Important!** External noise from trucks, train, traffic etc can easily disturb the measurement process. If the measurement result looks strange in any way you should do the same procedure again once or maybe twice. If you get the same result again you can be sure that it is correct.
Finally	Please remember that “good” sound is a matter of taste, so you have to experiment to obtain your personal goal. We wish you best of luck!

Software installation and connection

Software installation

Download the software from our website and install it according to the instructions.

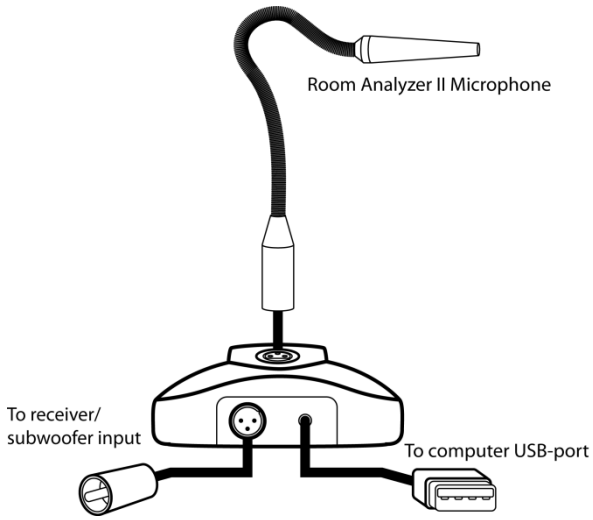
Download the software from http://www.xtz.se/uk/support/file-archive

Connection

Room Analyzer II

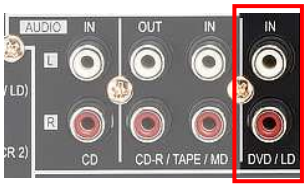
- Connect the USB-chord to your computer USB-port.
- Connect the Room Analyzer II microphone to the XLR connector on top of the sound card.
- Connect the RCA-cable to a line input on your receiver/subwoover.
- Start your computer and launch the Room Analyzer software

To avoid equipment damage the amplifier / subwoofer should be turned off during connection!



ROOM ANALYZER II KOPPLINGSDIAGRAM

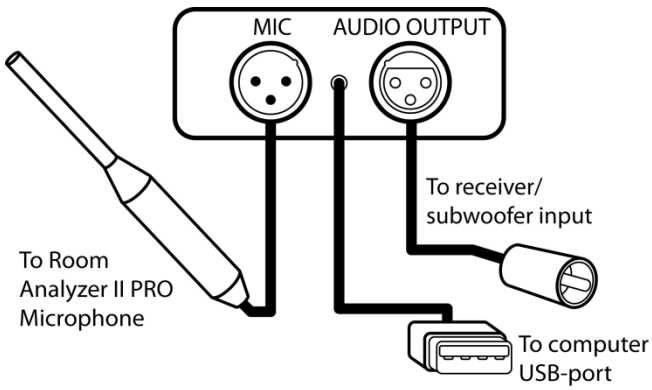
Y-splitter to distribute signal to both channels.



Example of how the amplifier inputs might look. Select a free one, for example DVD/LD

Ansluta Room Analyzer II PRO

- Connect the USB-chord to your computer USB-port.
- Connect the Room Analyzer II PRO microphone to the XLR connector labeled MIC the sound card.
- Connect the supplied XLR-RCA-cable from AUDIO OUTPUT to a line input on your receiver/subwoofer.
- Start your computer and launch the Room Analyzer software.



ROOM ANALYZER II PRO KOPPLINGSDIAGRAM

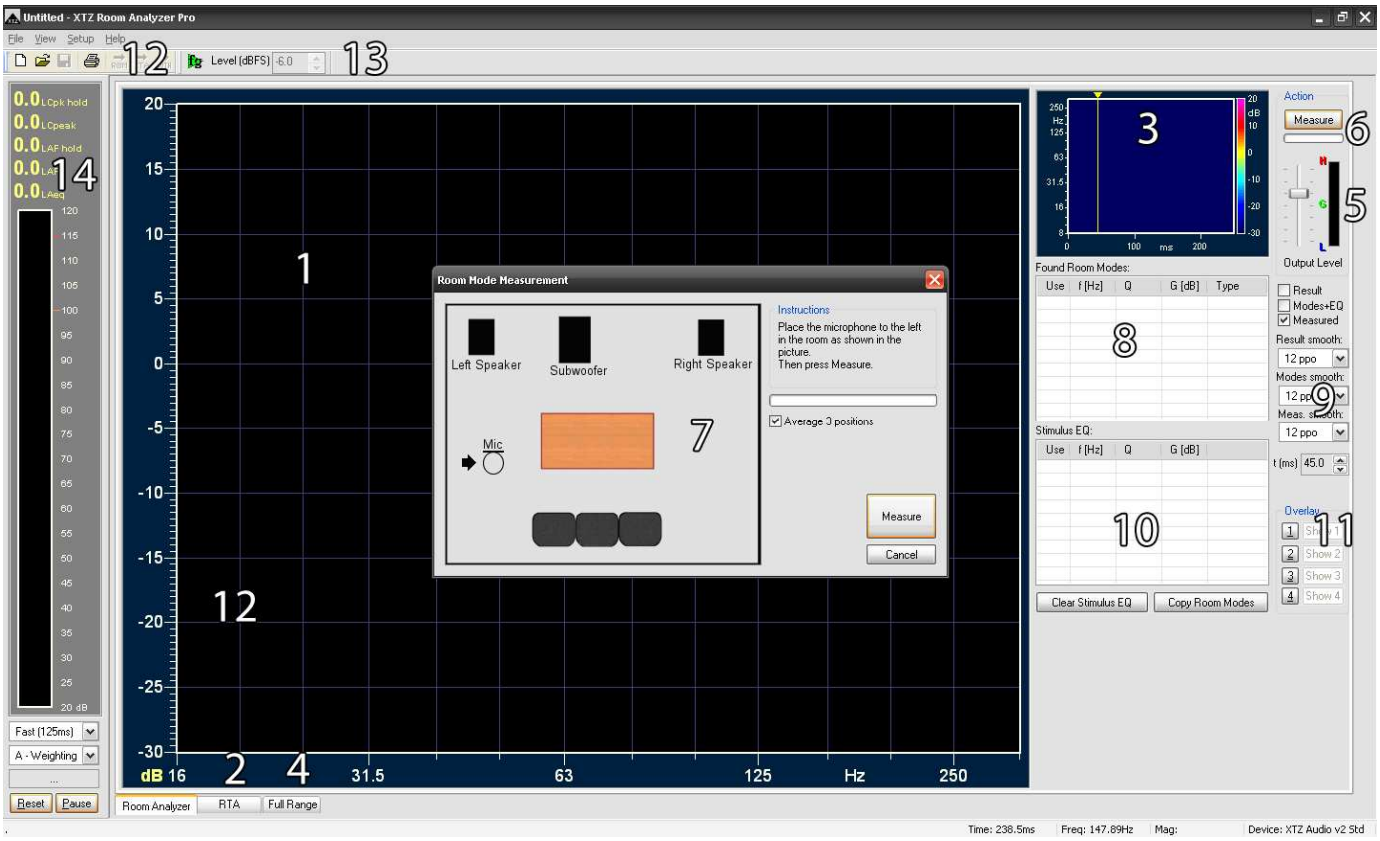
	If the Room Analyzer is to be connected to stereo system then you should use the - splitter to feed a signal to both channels. This should be connected to any input that is free to use such as a AUX/TV input. When making final adjustments, make sure signal is applied to all speakers and subwoofers in the system you wish to calibrate. Making separate adjustments to each channel will not accomplish a well-balanced end result.	
Placing the microphone	**High resolution room analysis - Room Analyzer** While doing room analysis the microphone should be placed in about listening position at ear height (70 cm – 110 cm from the floor). **Frequency response measurement - RTA/Full Range** While doing full range measurements the microphone should be pointed towards the speaker, preferably at the same height as the tweeter (the microphone is directionally sensitive above 5 kHz).	

Function reference

Working area

In the following section the functions marked on the screen shot below are explained. Every function is represented by a number in the picture below and is explained thoroughly on the following pages.

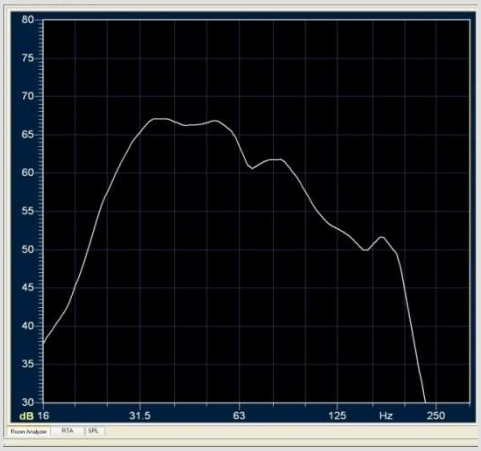
Some functions are restricted to the PRO version of the XTZ Room Analyzer II software. Functions that have been reserved for the PRO version are hereafter labeled ***PRO version only***.



1

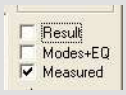
Room Analyzer

Shows the frequency response (Blue curve), room modes (Green curve) and calculated result curve (White curve)



You can switch the main window display between frequency response and spectrogram by double clicking on the main window.

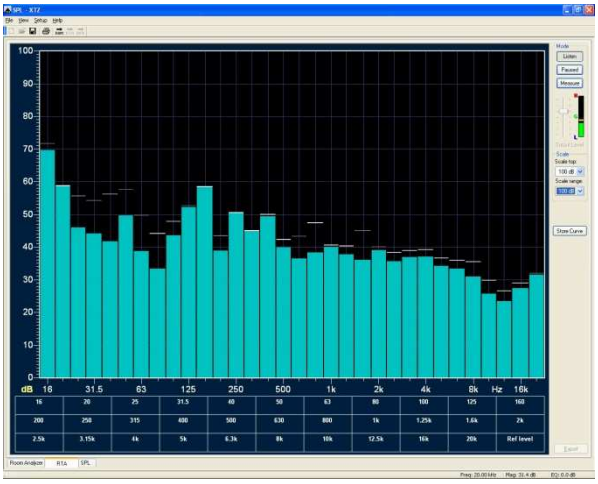
Select the curve to be displayed by checking or unchecking the relevant boxes.



2

RTA (Real Time Analyzer)

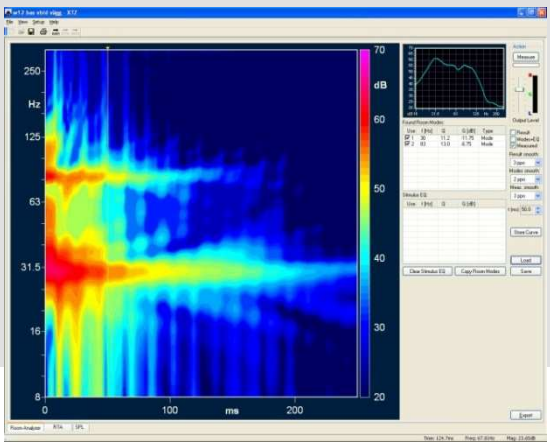
Measures frequency response (in real time) with a resolution of 1/3 octave.



3

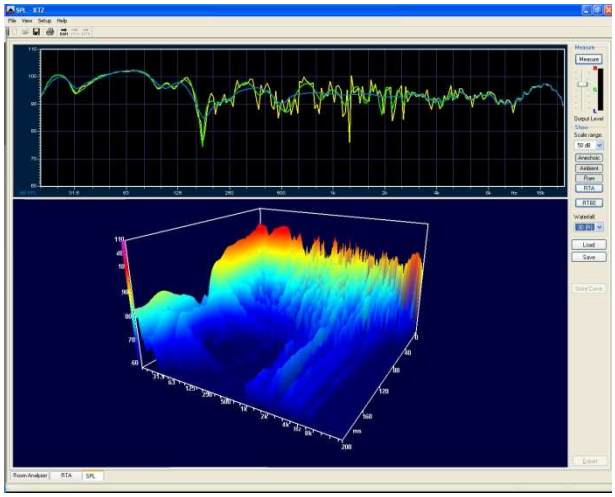
Spectrogram (PRO version only)

Presents an analysis of the decay time in the room. The time spectrum analysis shows a color spectrum of frequency, level and time.



4

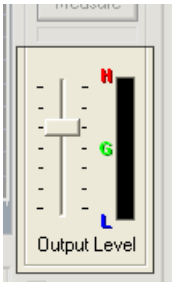
Full Range



Shows the frequency response from the measurement. Display alternatives available are Anechoic, Ambient and Raw.
Waterfall diagram can be displayed in 3D ***(PRO version only)*** and 2D.

5

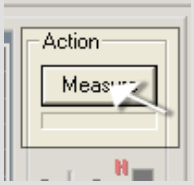
Output level
The signal level can be adjusted using the slide control to the right.
The signal level should be green:
Red = Too High
Green = Good level
Blue = Too Low



6

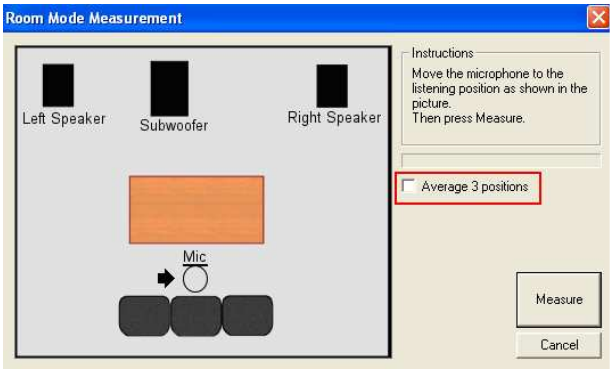
Measure - Start a measurement

Start the measurement by clicking the Measure button.



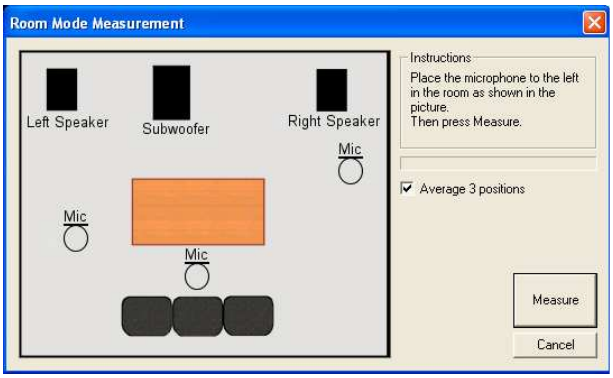
7

Measurement window – Room Analyzer



1-position method.

With the ”Average 3 positions” unchecked
a one position measurement is performed.



The picture shows all the positions displayed after one another during a measurement.

3 positon method
”Average 3 positions” gives you an average result calculated and measured at three positions in the room.

8 **Room Modes**
In this window all found room modes are displayed together with the recommended compensation parameters calculated for use with XTZ DSP products or similar products using Parametric EQ.

9 **Smoothing *(PRO version only)***

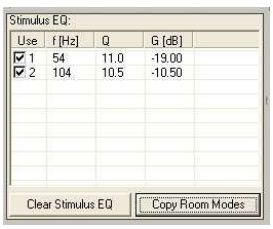
Smoothing is a way of evening out the result chart.
This can be done using different resolutions.
This is an act of balance depending on the equipment used, but also your individual choice.

Resolutions available are 2 ppo, 3 ppo and 6 ppo (points per octave).

10 **Stimulus EQ *(PRO version only)***

Room Analyzer provides you with recommended parameters for use in a Parametric Equalizer. These values can be moved to the Stimulus EQwindow by pressing the Copy Room Modes, and a new measurement will be completed that emulates the use of a PEQ.

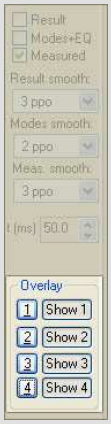
Stimilus EQ - Only visible in Advanced Mode



11 **Overlay – Full Range**

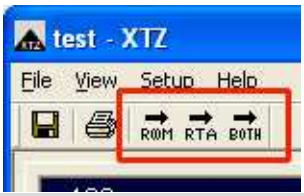
Provides an option to save and view measured charts on the screen. Up to 4 charts can be stored and displayed simultaneously individually. This is very powerful when comparing different settings and systematically working ones way towards the optimum settings.
The charts are displayed or hidden by clicking on ”Show”.

(PRO version supports 4 overlay positions while Standard version allows for 1 overlay position)



Only shown in ”advanced mode”

12 **Export buttons**
Export ROOM, RTA or ROOM+RTA to XTZ DSP products. (In order to utilize this function additional software is necessary to download the exported file to the XTZ DSP equipment.)



13 **Tone generator *(PRO version only)***
The tone generator is started by pushing the green fg-button.

Right-clicking the fg-button displays a menu allowing the user to choose between 10Hz-20kHz sine wave tones or white/pink noise.

The signal level can be adjusted between -100-0dBFS using the arrows or by typing in a value.

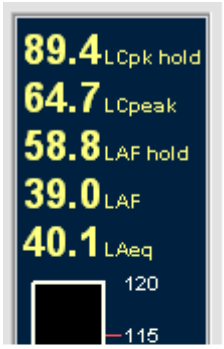
14 **SPL meter**
The SPL-meter (Sound Pressure Level meter) shows present sound pressure at the microphone position. The meter displays five different top and average levels as follows (top to bottom):

LCpk hold shows the highest SPL since start/reset

LCpeak shows continuous peak levels including short bursts.

Which values currently displayed on the bottom three indicators can be adjusted using the menus under the meter bar.

The top menu allows for switching between Fast or Slow average. (125ms or 1s). This is shown as an **F** for Fast or and **S** for Slow on the level indicators (LA**F** or LA**S**).



The second menu allows for switching between the weighted frequency curves:

A-weighting: (L**A**F)	Mimics the ears frequency response at low SPL.
C-weighting: (L**C**F)	Mimics the ears frequency response at high SPL.
Z-weighting: (L**Z**F)	A straight frequency response curve between 10Hz-20kHz

LAF hold Shows the highest average level measured with the current settings. The letter combination LAF will change according to your settings.
LAF Shows the current average according to the current settings. The letter combination LAF will change according to your settings.

LAeq ***(PRO version only)***
Shows current SPL according to the selected frequency curve. The letter combination LAF will change according to your settings.

Green meter line shows **LCpeak** level

Yellow meter line shows **LAF/LASpeak** according to the settings made above.

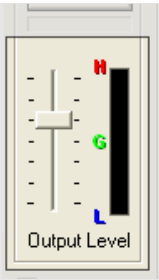
Timer Shows the run time of the meter since start or last Reset.

Reset Resets all averages ***(PRO version only)***

Pause Freezes all meter values ***(PRO version only)***

Menus	**This section contains information regarding the menus and their options**	
File		
New		
Open	Load previously saved measurements	
Save Save as…	Save measurements	
Import curve Export curve	Import measurement values from a txt-file Export measurement values to a txt file	
Export Screen Dump	Export measurement in picture format (.bmp)	
Print	Print Room Analyzer measurement and Time spectrum analysis	Black/White
View		
Toolbar	Shortcuts to Save, Print and quick buttons for exporting files to DSP-programming	
Statusbar	Display the pointer position in Frequency and Magnitude (level)	
Color Theme	Dark/Bright – Change the color theme of the program	Choose between a dark or bright theme
Setup		
Advanced mode	More options/settings for some functions • Stimulus EQ • Smoothing possibility • Load/Save (curves) • Change of scale (RTA window) • Export Room Analyzer & RTA	
Help		
About XTZ…	Software version	

Area of use

Before you start	Make sure the software is installed and the equipment is connected. Before the measuring procedure starts, make sure the microphone is placed in ear height when adjusting the output level.	See Installation and Connection.
Starting Room Analyzer	Start 'Room Analyzer' For advanced users, there is a choice called 'Advanced Mode' which has more settings and features.	
Setting output level	In order to achieve a reliable measuring procedure it is important that the correct output level is set. Put the control on the output level in the middle. Now there should be a white noise in the speakers. The level meter to the right should be up to the green "**G**". If the level is too high or low, adjust it with the volume control on the system/subwoofer. Small adjustments in output level can be made with the control bar. Click on 'STOP' to turn off the white noise.	 **REMEMBER!!** **HIGH SPL level can damage your ears.**

Suggested approach to equalization

The recommended approach is in two steps:

Step 1 - Room Analyzer
Room modes are treated by utilizing PEQ (parametric equalization).

Use **Room Analyzer** to find the room modes.

If the Room Analyzer suggests the use of PEQ, you need to include a PEQ in your system to be able to carry out the correction.

Step 2 - RTA/Full Range
After adjusting the room modes, continue by adjusting the frequency response in the listening position using the frequency response measurement in **RTA/Full Range** with a graphic EQ and/or PEQ

Room Analyzer finds the largest and most important room modes (all of them can never be included as this would demand an infinite number of PEQ filters).

Addition only refers to single position measurement method.
Tillägget gäller endast 1 positions mätning.
If the result is found to be not flat enough, use the High Resolution method several times and add more PEQ filters to achieve a better result.

You can use the function ”Manual adjustment of curves” on page 29, Advanced functions.

Measurement methods

There are different ways to measure the frequency response. To select the method, click on the tabs at the lower bar in the program. See the picture to the right.

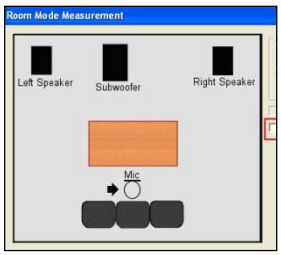
1. **Frequency response measurement - RTA**
   Measurement range is 16-20 000Hz.
   A simpler way showing the response throughout the entire audible range. The resolution in this option is 1/3 octave.

2. **High resolution room analysis - Room Analyzer**
   Measurement range is 16-250Hz.
   In Room Analyzer Pro there are two ways for the high resolution method: 1- or 3-position measurement.

   1-position measurement

   For optimizing the sound without compromise a “1 position measurement” should be used. Examples of when to use this mode include a stereo or home theater with only one seat that you care about.

   The “risk” with “1 position measurement” is that the sweet spot could be in a room mode or boundary intereference related dip. Sometimes it is impossible to compensate for these dips without causing other problems. One solution is to move the listening or speaker/subwoofer position.



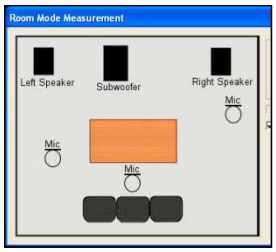
One position measurement

1 position measurement can be used with the following measurements:

- Room Analysis
- Frequency response
- Speaker frequency response
- Reverberation analysis

3 position measurement

Normally, the recommendation is "3 position measurement". The measurement is made in 3 positions in the room, producing a more accurate measurement that helps find room modes easier.



The three positions suggested to perform a measurement

3 positions measuring can be used for:

- Room Analysis
- Reverberation analysis

3. Frequency response measurement - FULL RANGE

A full range measurement is done using a sine sweep between 20-20 000Hz instead of the RTA method's pink noise.

There are options to choose between three time windows:

Anechoic, Ambient and Raw

By clicking the RT60 button the decay time for several frequencies will be displayed at the same time. RT60 is shown according to the ISO3382-standard.

RT60 shows the amount of time for the sound pressure level to decay 60dB This is a standard method to evaluate the decay time of a room.

4. *(PRO version only)*
Tone Generator

The tone generator can be used in conjunction with the SPL meter or RTA analyzer to test system function and performance at specific frequencies or over the entire audible spectrum.

The following test signals are available:

Pink Noise
White Noise
Sine wave with frequencies: 10, 12.5, 16, 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1k, 1.25k, 1.6k, 2k, 2.5k, 3.15k, 4k, 5k, 6.3k, 8k, 10k, 12.5k, 16k and 20kHz

5. ***(PRO version only)***
Measuring sound levels using the SPL meter and Tone Generator
Your system levels can be calibrated using the SPL meter and tone generator. These tools are also useful for monitoring sound pressure levels produced by your system.

To make a measurement which as closely as possible resembles how the sound pressure is perceived by the ear. Choose ***Fast*** in the top menu and ***A-weighting*** for low SPL levels or ***C-weighting*** high SPL levels.

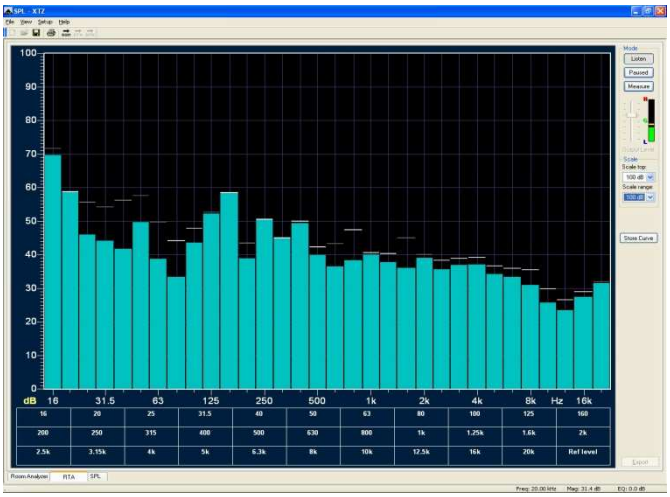
Set the volume of the function generator below -40dBFS to protect your equipment.

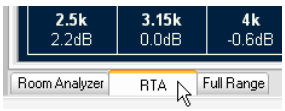
Choose signal type by right clicking the fg-butting.

Start the signal by clicking the green fg-button.

Frequency response measurement - RTA

RTA
(Real Time Analyzer)





RTA is a full range measurement. Above 5 kHz the microphone is direction sensitive and should be pointed towards the sound source.

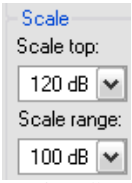
Click on the RTA tab. Click “Measure” to start the measurement and stop it by clicking ”Paused”.
Each bar displays the sound pressure level (SPL) for fixed frequency bands.Below the bar diagram you can see the SPL at each frequency as a number.

The RTA shows the frequency response in real time. It measures the energy level at different frequencies in the room. It is therefore common for the curve to differ from the sweep measurement.

RTA shows the measured energy with 1/3 octave resolution and as a continuous moving average (average in a short time frame).
It doesn´t have the same high resolution as Room Analyzer or the Full Range measurement, but still gives a good picture of how the sound will be experienced.

Click ”Listen” to activate the listening mode. This mode is suitable when you want to monitor the sound changes in the room in real time, but less suitable for adjustments.

The scale can be altered using the ”Scale”-settings. The Y axis top value and range can be adjusted.



The options for adjusting the Y-axis scale.

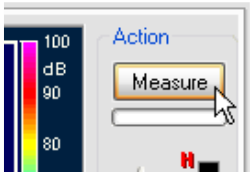
Frequency response measurement – RTA is perfect for checking the frequency response when placing speakers/subwoofer, finding a good listening position, or adjusting a graphical equalizer.

Export
Exporting to XTZ DSP-products can be done via the menu or using the quick buttons shown on the diagram to the right. ”Both” means that the automatically generated parameter values are exported together with the RTA values.

NOTE!
For a complete room analysis you should use the Room Analyzer first, then perform a RTA measurement.

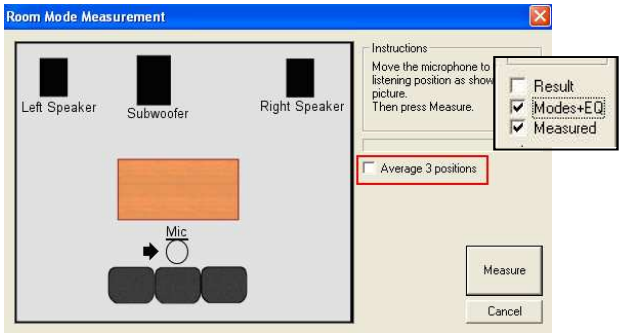
Start measurement

Click ”Measure” to start the measurement procedure.



1-position measurement

- Uncheck ”Average 3 positions”



- Click ”Measure” to start the measurement.
- The measurement window is closed after a short while and the results are displayed.

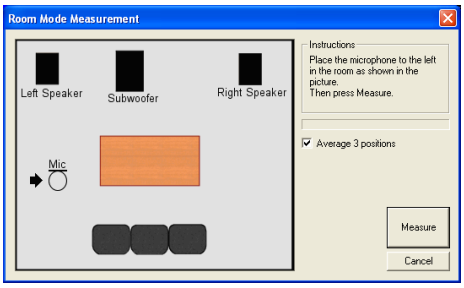
Read about the differencies between single position measurement and three position measurements in the chapter ”Technical explanations”.

You can use both methods without problems and compare the results to decide which one you prefer.

3-position measurement

When doing a 3-position measurement the box *”Average 3 positions”* should be checked. In order to achieve an accurate result the measurements should be done in positions that are not too close to each other:

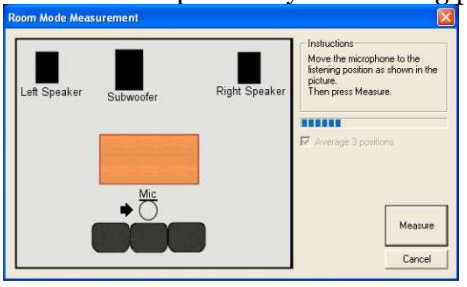
- Place the microphone as shown
  (To the left in the room, some distance from the wall)



- Click ”Measure” to start the first measurement.

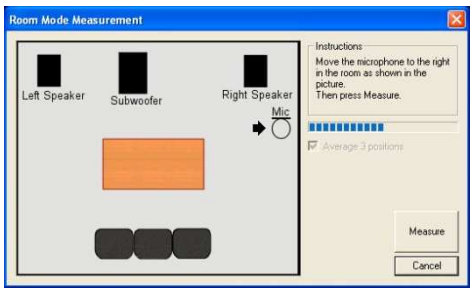
A sine sweep is heard from the speakers during each measurement.

- Move the microphone to your listening position.



- Click ”Measure” to start the second measurement.

- Move the microphone to the right in the room, this time closer to the speakers.



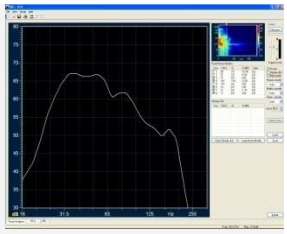
- Click ”Measure” to start the third measurement.

The measurements are now finished and the window will be closed when the calculations are done.

Measurement results, Frequency response

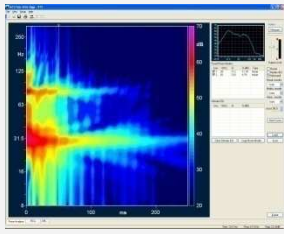
After a short while the) the *"Room Mode Measurement"* window will be closed and the results from your measurements will be presented.

In the main window, the frequency response is now shown. The reverberation time is shown in the smaller window to the right.



If you double click in the main window the data displayed in each window change.

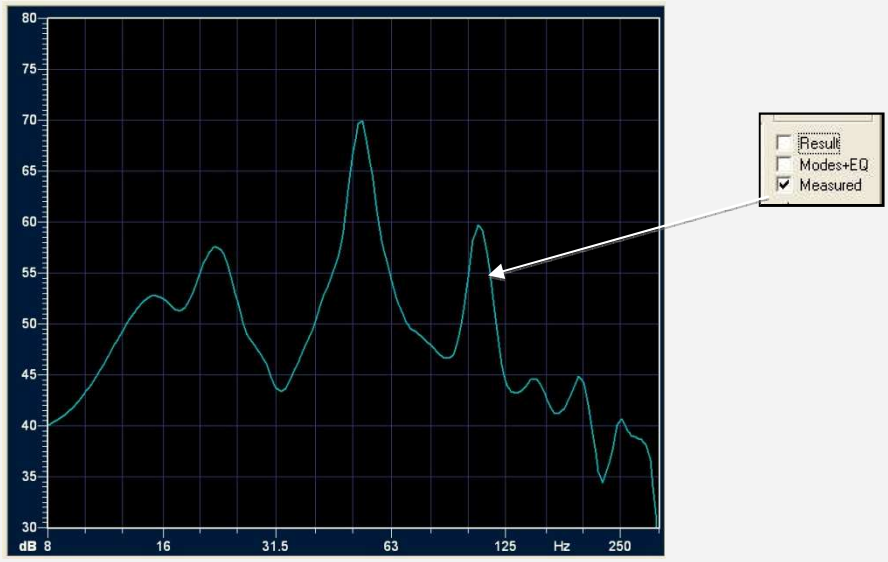
Double click on the large window area to swap the main dispay between frequency response and spectrogram.



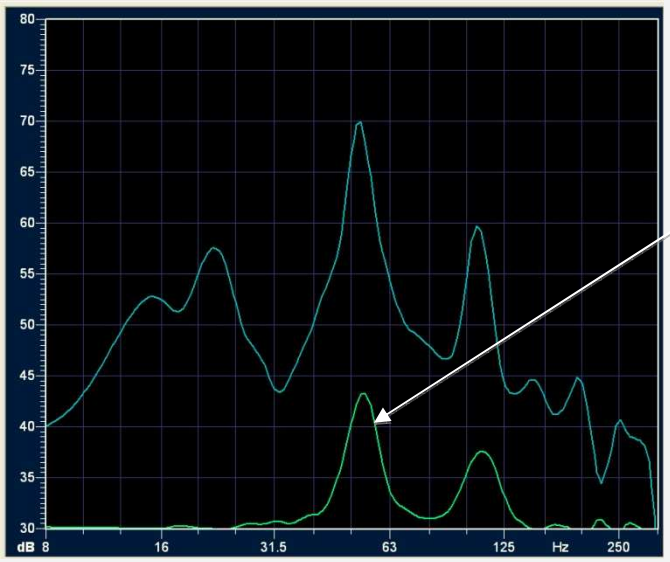
There are three different curves.
Choose by clicking on the right side (see picture):

- Measured - Blue curve
- Modes+EQ - Green curve
- Result - White curve

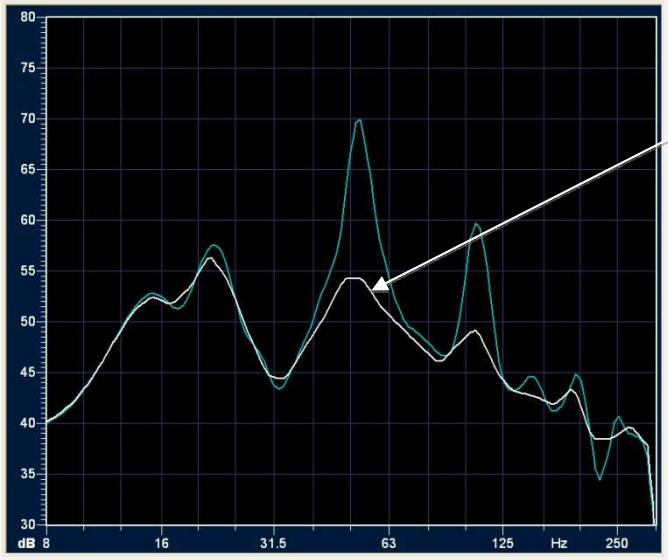
The standard curve, the blue, is the measured frequency response.

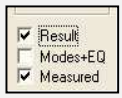


The green curve shows the frequency response for room modes and EQ adjustments recommended in Found Room Modes. The values in "Found room modes" are those that are shown in the green curve.



The last graph is a calculated curve, it displays the expected result from using a PEQ with the suggested parameter values. Correction is done according to the values shown in ”Found Room Modes”.



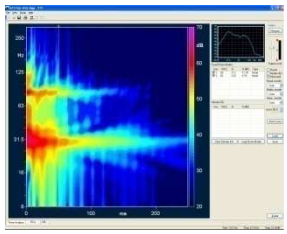


In **Advanced Mode** you can adjust the graph´s resolution with three different smoothing amounts - 2, 3 or 6 ppo (points per octave) can be selected.

(PRO version only)

Measurement result, Spectrogram

In the smaller window to the right, a spectrogram is shown – a 2D waterfall diagram. This picture shows a color spectrum with frequency, amplitude and time data. This is a powerful tool to measure, analyze and (when necessary) treat your room in terms of reverberation time in the bass region. This can be done using DSP, Parametric Equalizer of other types of acoustic treatments.
To obtain a better overview you can shift places between the two windows by double clicking on the large window.

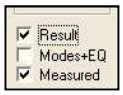


Reading the graph

Data is put together and displayed in the graph:

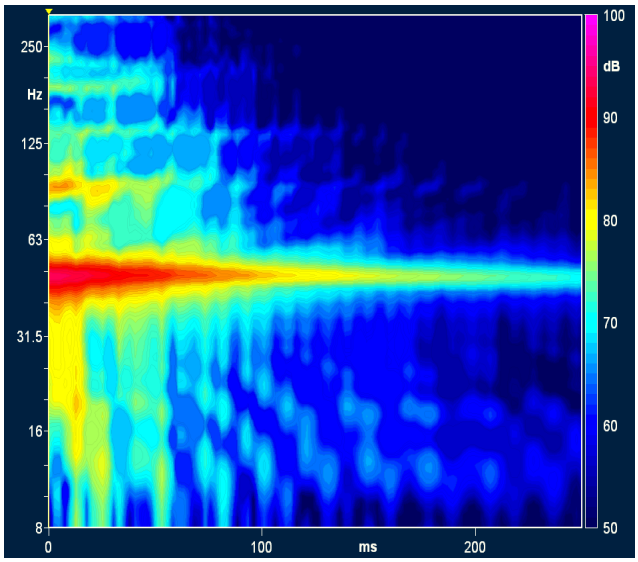
Color scale	- Amplitude
Vertical axis	- Frequency
Horizontal axis	- Time

The idea of the spectogram is to show the decay time as a function of time and frequency. An uneven color spectrum suggests an uneven frequency response in the room. High amplitudes (warm colors) reaching far into the right of the chart shows that there are problems with long decay times.

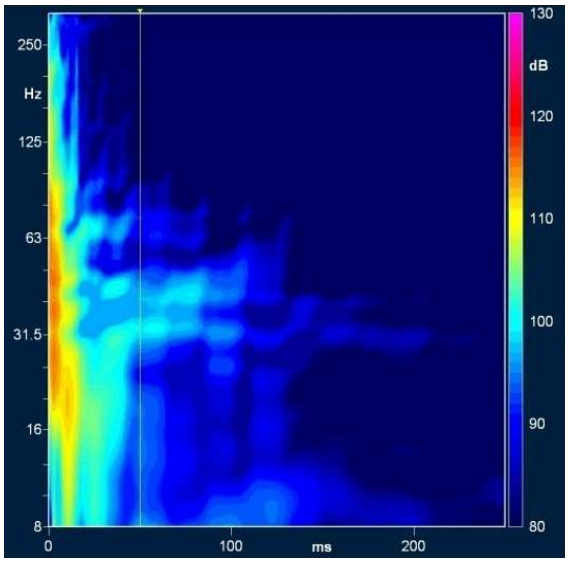


In the same way that Room Analyzer can show different graphs for *Result, Modes + EQ* and *Measured* can these be displayed in the spectrogram window.

Below you can see two examples where the left room has big problems with room modes and very long decay time, while the other room can be considered very well treated with an even frequency response.



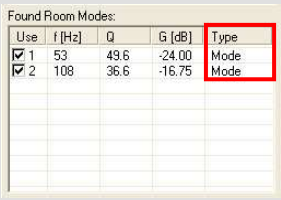
A poor room with long decay times and heavy room modes.



A good room with short decay time and even frequency response.

Measurement results, Found Room Modes

Found room modes that need compensating are shown here.



Mode: A room resonance (these are the first priority to deal with)
EQ: A ”bump” (peak in a limited frequency area) in frequency response where it is recommended that EQ be used.

Values presented in ”Found Room Modes” can be used directly in a subwoofer with PEQ (Parametric Equalizer).

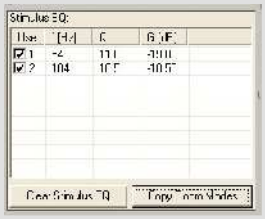
Export to XTZ DSP-Products

Values presented in ”Found Room Modes” can be exported to a file for import to the software included with XTZ DSP products (XTZ PC-remote).

Click *Setup* > *Export* to export the suggested parameter values. You can also export by clicking in the quick button *”ROOM”*.

Stimulus EQ *(PRO version only)*

The Room Analyzer presents values (based on the measurements) for use in a PEQ. These values can be copied to the Stimulus EQ window by clicking on ‘Copy Room Modes’. The Stimulus EQ ‘simulates’ a PEQ inserted in the signal chain with the values setup as in the table - this is a fast and efficient way of trying out the best PEQ values to optimize your system!



.

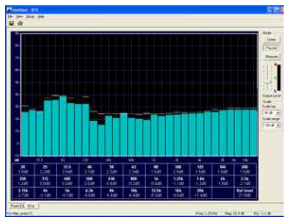
To simulate a PEQ in your system:

- Perform a measurement with Room Analyzer
- Save your data with the Overlay-function
- Click *”Copy Room Modes”* to copy the values to ”Stimulus EQ”.
- Repeat the measurement procedure using the now adjusted signal.
- Save your new measurement with the Overlay-function and compare by clicking the corresponding Show-buttons in the Overlay-panel.

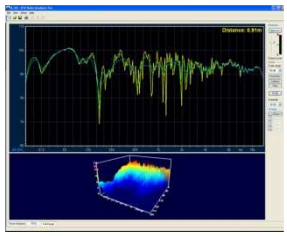
Values in the ”Stimulus EQ” table can be deleted by clicking *”Clear Stimulus EQ”*.

Final adjustments

You can finally tune the frequency response using a graphic EQ. Through a frequency response measurement using **RTA** or **Full Range**-tools you can analyze the entire audio range and determine if any further high precision adjustments are necessary.
The room compensation is now finished!



If the measurements were done with only a subwoofer connected, the results will differ when the complete system (front-/center-/surround speakers) is connected. It is wise to perform an additional frequency response measurement with all speakers in operation.



If the final result is not adequate it might be because of measurement interference. Try re-doing the measurements at a slightly higher sound pressure level.

(Please see page 18 for additional information about frequency response measurements with **RTA** and page 30 for **Rull Range**)

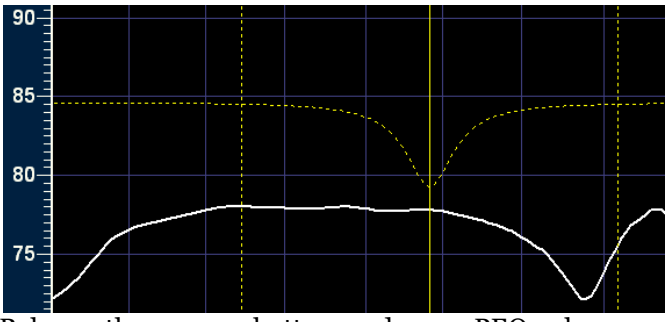
Advanced functions in Room Analyzer

Manual adjustment of curves (Drag & Drop-adjustment)

The following functions are only shown in ”**Advanced mode**”

In **”Advanced mode”** there are additional tools available offering further adjustment options for the advanced user.

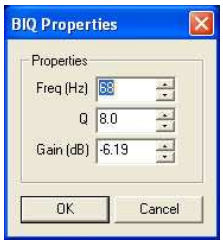
By clicking the right mouse button you can ”grab” a peak or a dip, then move the marker to correct the curve manually. By moving the marker sideways the frequency is altered.



Release the mouse button and new PEQ-values are suggested. The new PEQ suggestion can be edited if a more accurate setting is wanted. This is done by double clicking the value and editing the Frequency, Q and Gain. Another method is to right click on the value and select ”Properties”.

Additional suggestions demand more PEQ channels.

NOTE! Use curve editing with caution. Remember that your amplifier might be subject to a harder load if the curve is edited to increase the level at some frequency. Begin with small changes and lower parts of the curve rather than elevating them!

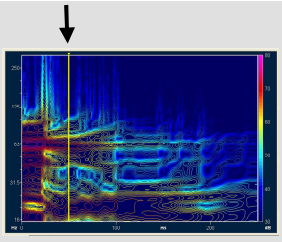


PEQ-suggestions cannot be imported to XTZ DSP products as the new values overwrite the previous ones. They have to be added manually.

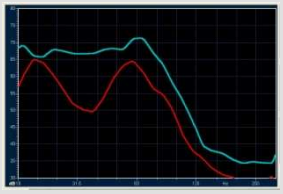
***(PRO version only)* Adjusting the measurement time axis**

Important!

The frequency response in Room Analyzer is measured at ”time zero”, marked in the spectrogram with a yellow line. The yellow time line can be moved sideways by clicking and dragging the line with the left mouse button. The frequency response at the time where the line is (0-250 ms) is shown in red.



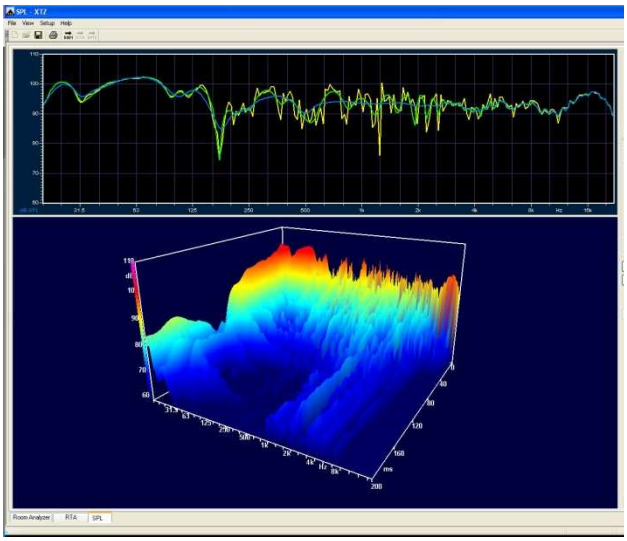
This explains why the frequency response might look uneven at time zero in spite of PEQ or GEQ correction. The other way around, a dead flat frequency response at time zero may not be at all optimal as interference may occur later in time affecting the listening impression. For this reason, the decay time is of great importance. The experienced frequency response is the sum of the energy over time, something the RTA can display.



Frequency measurement Full Range

Full Range

The **Full Range**-tab displays the tools to make full range frequency response measurement. When measurements in the room have been made you can select a variety of presentation options to enable you to analyze the information in the best possible way.
Below is an example of a frequency response and waterfall diagram in 3D (***3D view available in PRO version only)*** displaying data in the time domain (0-200 ms).

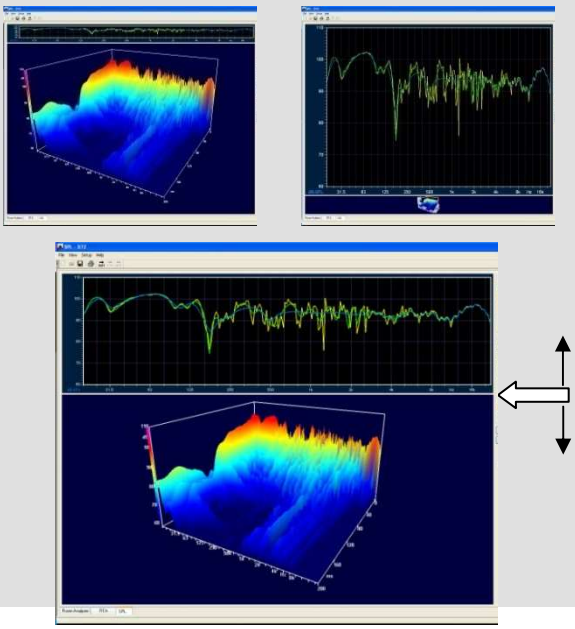


Full Range measurements can also be used to measure the room itself. It offers higher resolution than RTA, but not the same resolution as the Room Analyzer in the bass area.

Working areas

The **Full Range** screen has a divided working area.

You can adjust the size of the two parts by clicking on the grey space between them and dragging up or down.



View
(PRO version only)

There are three different curves that can be displayed in the measurement window, to show different kinds of information. The window type used is the Half Extended Cos Bell with 20% taper.

Anechoic – No room interference
(300/4 ms, Multi-Win)

Shows the frequency response without room interference.

Ambient – Room information
(300/8 ms, Ambi-Win)

Shows reflections from the room and room modes

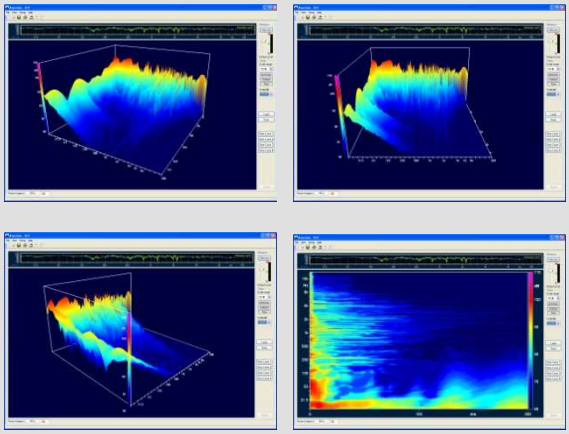
Raw - Untreated
(300 ms, Full FFT)

All the information is displayed untreated. This method offers the highest resolution, but demands that the results can be properly evaluated in return.

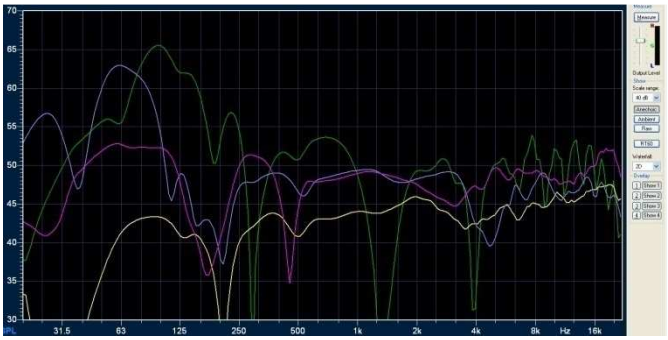
Waterfall diagram (CSD)
(300ms /slice, total length of 200ms, sliding CSD)

2D- or 3D-view can be selected where the 3D version can be viewed from three different angles. In 3D-view the x-axis shows frequency, the y-axis shows the magnitude and the z-axis shows time.

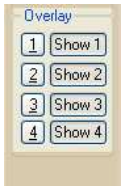
In 2D-view the same information is displayed, but the Y-axis has been flattened out and shown only as a change in color.



Overlays



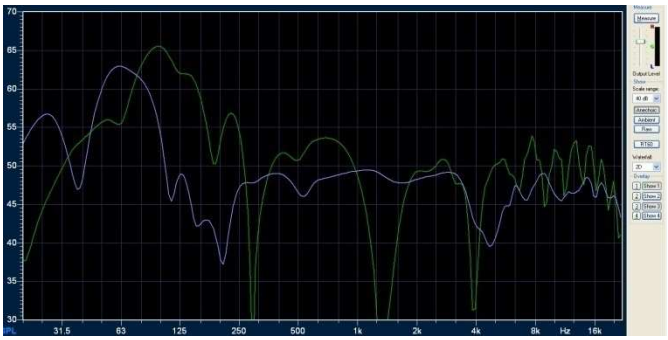
Only shown in ”Advanced mode”



Room Analyzer offers the possibility to save up to 4 curves (PRO version) or 1 curve (Standard version) on the screen. This is done by clicking on 1,2,3 or 4 in the Overlay area.

It is always the last measurement that is saved.

To store a new curve simply do a new measurement and click the Overlay button you want to replace.
To hide or show a curve, use the ”Show”-button.



The picture shows that curve 1 and 3 are active

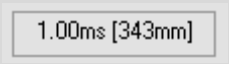
Volume setting

The volume of the signal sent to your system can be adjusted with the ”Output Level” slide bar.
A higher volume achieves better accuracy. Remember not to exceed your systems limits.

Start Full Frequency measurement

The measurement is started by clicking the ”Measure” button. Four sine sweeps follow and the measurement is done.
This gives you a variety of information. First, the frequency response, with different window settings, a waterfall chart showing the measurement in respect to time and finally RT60 values. These are displayed as bars where the decay time values are visible above each bar. This is done according to ISO 3382 standard.

Evaluating the results perfectly takes experience and

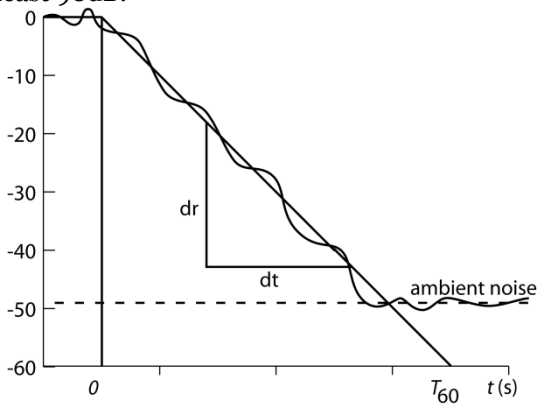
	knowledge, but most of it can be interpreted relatively easy. Measurements performed at longer distance often present dips in the bass region. The cause is heavy room influence, microphone- and speaker placement. To see how a bass speaker or subwoofer really performs you need to do a near field measurement to avoid the room to influence the results.	
Delay Alignment	The Alignment function in the Full Range view is a tool to adjust the time delay between your systems channels/subwoofer. Better phase accuracy at the listening position is accomplished by delaying individual channels separately. How to perform a time delay measurement between your speakers and subwoofer: 1. Place the microphone at the listening position. The microphone position must remain unchanged for all measurements. 2. Make a measurement applying signal only through one of front or surround speakers. 3. Press Overlay button 1. 4. Make a measurement applying signal only through your subwoofer. 5. Press “Align Delay”. Controls for aligning the delay manually are now displayed if you wish to do so. 6. Press “Auto Align”. The time with which your signal needs to be delayed is now shown in the time window to the right of the controls. If your system doesn’t allow for signal delay you may reposition your subwoofer by the distance suggested in brackets in the time delay window.	 

RT60 Decay time

Decay time or reverberation

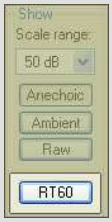
One of the room´s most important parameters is the decay time – T.
RT60 shows how long it takes for the reflected sound to fall 60 dB below the direct (non-reflected) sounds original level, and is a standard way of measuring the rooms decay time. (measured with 1 octave resolution).

In order to achieve an accurate RT60 measurement the sound level output must loud enough for the program to discern the signal from the natural noise floor, which can be around 40-50 dB in a regular room. Ideally measurements should be made at a sound pressure level of at least 90dB.



To calculate RT60 the signal level change of 60 dB is divided by the time it takes for the level to drop.

Measurement window



The decay time is presented in octaves between 125 Hz and 4000 Hz. At frequencies below 125 Hz the results are inaccurate, and above 4000 Hz air absorption becomes the key limit.

Technical terms and concepts explanations

Room modes

Room modes occur as the result of reflected sound in the room. Direct sound and reflected sound form a pattern and where the waves end up in phase the room modes are found.

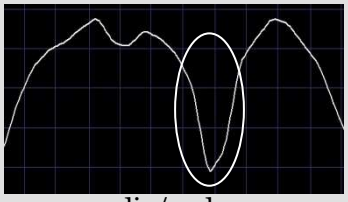
Mode: Resonance at a certain frequency
Node=dip: Point where amplitude is close to zero (resonance)
Standing wave: A standing wave occurs when a wave is reflected against a wall. Two opposite waves are created whose sum does not transfer any energy. In the case of a single wall no room mode exist, but there could still be standing waves..

Phase cancellation/ Peaks/Dips

If a direct sound wave is in phase are in anti-phase they cancel out and you get a room node, which in many cases can be better than a room mode.
If several waves are in phase or anti-phase, peaks or dips form.

If extreme dips are found during a measurement, these can be impossible to compensate for and a change of listening position or speaker placement should be considered.
A node is shown as a dip in the Room Analyzer measurement.

peak/anti-node


dip/node

1-position measurement

3-positionsmätning (Average 3 positions)

If you want to optimize the sound without compromise the single position method should be used, which can be suitable if the Room Analyzer is to be used with a extremely expensive high performance system in combination with a very good listening room.
The "risk" with "1 position measurement" is that the sweet spot could be in a dip. Sometimes it is impossible to compensate without having other problems. One solution is to change sweet spot and/or move the speakers/subwoofer.
As a last check a single position measurement can be done.
Normally, the recommendation is "3 position measurement". The measurement is made in 3 positions in the room, producing a more accurate measure, and to find the room modes easier, and more accurate countermeasures can be suggested.
Treatment of the main room modes usually obtains a better listening experience in the entire room.
This demands equipment with PEQ (Parametric Equalizer), such as XTZ DSP products.
Use both measurement methods and compare the results to determine what method you want to use.

Decay time

Shows how long time it takes for the sound pressure has decreased to a certain level.

	All rooms have a decay time, but a very long decay time affects the sonic performance in a negative way. A hard hand clap can give a rough indication of the decay time. A short decay time is preferable, and can be achieved by adding more absorbing materials in the room, such as furniture, carpets, cupboards and curtains. There are specialized companies that are able to assist with these kinds of room acoustic treatments, but you can get far just by some well though through furniture. Even in a room with a fairly flat frequency response the decay time may be a problem, as frequency response is commonly measured at time zero, and no respect is taken to the reflected sound.	
Room Analyzer	Room Analyzer shows the frequency response (Blue curve) with a high resolution, the true frequency response or the exact response down to each frequency. Therefore, any flaws in frequency response can be detected. In Advanced Mode you can adjust the resolution (smoothing) in several steps. Room modes are shown in green. These are caused by the room, and ideally the goal is to get rid of all room modes. Then you have removed the largest problems of the room. The calculated result (White curve) shows the result using DSP treatment according to the suggested PEQ parameters.	Smoothing determines with which resolution and precision a graph should be presented. This is a compromise depending on your equipment and personal preference. Using the highest resolution it will be impossible to achieve a completely flat frequency response. The resolution can then be lowered using smoothing in several steps to give a more relevant result according to how the human ear experiences sound. How well minute differencies in sound can be heard depends on each persons ability, age and so on.
RTA	The RTA shows the frequency response in real time. RTA shows the experienced energy with 1/3 of an octave resolution as a moving average. In other words, it doesn´t offer the same high resolution as the Room Analyzer feature, but it offers a good indication of how the sound is experienced when listening to music.	
EQ/PEQ	Equalizer – a tool that can elevate or suppress the level of certain frequencies. A graphical equalizer has predetermined frequency bands. A parametrical equalizer can be adjusted to a specific frequency, Q-factor and amplitude.	

Full Range	The Full Range-tab is the most advanced feature in the Room Analyzer. Full frequency measurement with higher resolution than the RTA is available as well as tools to how much of the room effects should be shown in the results, and finally which of the measurement charts should be displayed. RT60 is a decay time measurement done according to the ISO 3382 standard and tells how long time it takes for different frequencies to ”leave the room”. This is visually presented as red bars with the decay time on top. Further, there is a waterfall measurement that can be displayed in both 2D and 3D. Using this method tons of information can be obtained.
Smoothing	Smoothing determines with which resolution and precision a graph should be presented. This is a compromise depending on your equipment and personal preference. Using the highest resolution it will be impossible to achieve a completely flat frequency response. The resolution can then be lowered using smoothing in several steps to give a more relevant result according to how the human ear experiences sound. If you have a good listening room, a good system and some experience from sound you can use the highest resolution. If you are less experienced or have not as good equipment we recommend using a lower resolution.
Connecting the Room Analyzer to your system.	If the Room Analyzer is to be connected to a complete system (front speakers + subwoofer) you need a Y splitter to feed the signal to both channels. This is connected to AUX/TV or any other line input free to use.

Technical specifications

Microphone	USB-microphone – software compensated for a flat frequency response between 16Hz-20kHz	
Bandwidth	20-20 kHz - RTA 16-250 Hz - Room Analyzer 20-20 kHz - Full Range	
Filter type	Parametric EQ with variable Q	
Measurement method	Chirp (log sine sweep) and FFT	

Service & support

Where to send the product for warranty service?	For service we refer to our retailers. If you have questions about servicing, please contact our support: email: **support@xtz.se** website: **http://www.xtz.se**	Always pack the product/part very carefully as transportation damages are common. If the packaging is insufficient, the courier will not pay for the damages. Always include a copy of you receipt and a description of the problem.
Support	Contact our free of charge support line if you have questions or need advice about installing a subwoofer, speaker or software, or if you run into any problems during installation. Measurement results can be hard to interpret. Send us your graphs and we will help you analyze them! Contact us using email **support@xtz.se** and include your phone number if you wish us to call you.	